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ABSTRACT

Publications in the fields of educational science, organization theory, and project management were analyzed to identify the possibilities that modularization offers to institutions of higher professional education and to obtain background information for use in developing a method for modularization in higher professional education. It was discovered that, in higher education, modularization is generally regarded as a means of organizing programs more efficiently, maintaining/improving program quality, and bringing programs more into line with demand for additional training. Educational innovation was found to go hand in hand with organizational development. Modularization programs were found to consist of three stages. In the first stage, modularization is primarily a matter of policy in which objectives are of paramount importance. It is in this stage that decisions to divide study loads into standardized units are generally made. The second stage of modularization is aimed at the curriculum and is the stage in which diploma requirements and objectives of modularization are finalized on the basis of information about labor market demands. The third stage of modularization is the logical elaboration of the decisions made in the first two stages and is the time when decisions at the modular level are made. (Contains 30 references.) (MN)

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Modularization and flexibilization

ED 374 211

R.M. van Meel

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Modularization and flexibilization

OTIC Research Report 60

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Abstract

Modularization is often an important stage in the development of a traditional educational institute towards more flexible educational programmes.
The present report discusses the possibilities which modularization offers to institutes for higher professional education. A method for modularization in higher professional education is developed on the basis of the main conclusions concerning educational innovation. The formulation of this method is based on publications in the fields of educational science, organization theory and project management. The major sources with respect to the development of individual modules are internal publications and expertise of the Open University.
Important conclusions are that modularization must always be "made to measure" and that the ambitions and possibilities of the institutes should be taken as the starting point. With regard to policy-making, a top-down approach is proposed, because educational innovation must be anchored firmly and structurally in the organization. The principal actors in the setting up of a modularization programme are the Board of Governors, the directors of study programmes, the department coordinators and the teachers. Dividing the modularization programme into various implementation stages makes it possible to create a more flexible learning environment. Thus taking into account the available resources and possibilities of the management, the teachers and the students of institutes for higher professional education.

1 Introduction

In the educational literature, modularization and related concepts have a relatively long history. The trend towards modularization was initiated by various schools of thought. Linking up with the tradition of the cognitive development theories (Piaget, Landa, Bruner), Burns advanced a number of hypotheses about individual instruction in 1971. Empirical data based on the observation of students had led to the assumption that students can achieve optimum learning results if they can individually determine their learning objectives, learning pace and educational materials. It is considered possible to set up individual instruction in classroom situations by means of modules. In Burns' view, modules may take a variety of forms, but can in general be described as organized learning periods of one to three hours. In this context, flexibilization means transforming the traditional educational system into a study system which focuses on the student's learning process and meets his individual needs to the greatest possible extent. This approach elaborates on the insights resulting from research in the field of cognitive development psychology. From a theoretical point of view, the insights as presented by Burns (1971) are diametrically opposed to the ideas of the behaviourist schools. These schools are centred around Skinner's publications of 1954 and 1965 and have in practice resulted in programmed instruction. Quite apart from the theoretical controversy between the behaviourist schools and the cognitive development educationalists, the distinction between learning theory and instructional method introduced by Skinner has presently been acknowledged as a general principle. This principle was initially further developed by authors with a moderately behaviourist view such as Ausubel (1968) or a more cognitive view such as Bruner (1960, 1966).

From a totally different perspective, modularization has increasingly been perceived recently as a means to diminish the operational costs of institutes by decreasing the hours of face-to-face teaching. Since the beginning of the 1990s, a direct connection was established in the Netherlands between financing of higher professional education and the success rate of the students. Partly due to this fact, institutes are looking for new educational techniques which make it possible to increase the study pace while keeping up or improving the quality of the educational programme. Modularization is considered as a possibility in this context as well.

Finally, there is a growing interest in modularization because it is considered as an opportunity to organize existing study systems in a more flexible way. Thus making it possible that the need among particular groups for updating and upgrading their knowledge can be fulfilled without enormous additional investments being required. The term "flexibilization" is interpreted by some institutes as searching for ways to make education accessible to the wider public. This could be achieved, for instance, by setting up an educational organization which can be attuned to students who differ greatly regarding their prior knowledge or previous training, or can swiftly be adapted to new requirements of the labour market.

Against the backgrounds outlined above, it is useful to outline the possibilities of modularization from the perspectives of the institutes, the teachers and the students. The preconditions and consequences which are inextricably linked with modularization will also be examined. This analysis will serve as a reference for designing modularization procedures for particular institutes.

Definitions

Originally, a module used to be defined as a unit of study. The oldest and still one of the most frequently quoted definitions was published in 1973. According to Goldschmid & Goldschmid (1973: 16), a module is a "self-contained, independent unit of planned series of learning activities designed to help students accomplish certain well-defined objectives", to which the authors add that modules are as a rule study packages aimed at self-study. Levine, Daeschner & Emery (1977: 213) propose the following definition: "An instructional module is a unit of instructional materials which contains objectives describing learner behavior in clearly observable form, instructional material and a post-test clearly related to the objectives". Van Eijl, Cappetti, Merkx & Van Muyden (1988) have added the characteristics "course requirements" and "self-assessment test" to this definition.

Summarizing, the essential aspects of a module as a unit of study can be listed as follows:

1 a module is a self-contained unit in the curriculum (identifiable and recognizable);
2 which constitutes some coherent whole of course requirements, learning objectives and contents;
3 with a well-defined study load and duration, and
4 which contains the teaching/learning situations and testing material aimed at acquiring and processing the objectives and contents of the module.

In addition to the contents and the setup of a module, the duration of study is not a negligible aspect. The second definition of modular education places particular emphasis on this planning dimension of a module. From this point of view, modularization is a term which indicates that the curriculum has been divided into a number of sections with a certain standard duration. An assumed fifteen-week term (containing 600 study hours) may be organized in various ways:

- 4 parallel modules of 150 hours, to be taken simultaneously
- 2 double modules of 300 hours, to be taken successively
- 2 modules of 75 hours, and 3 of 150 hours
- 1 module of 600 hours.

It should be noted that successive programming of parts of the curriculum is the basic principle of block education (Wijnen, 1973; De Bruyne, 1976; Cappetti, 1985).

Because in this sense, modularization is restricted to the division of the curriculum into units with a particular study load, a number of different educational methods can be imagined here too. In such a study system, self-study may not be performed at all or only to a very limited extent while face-to-face teaching may predominate.

2 Modular education

2.1 Objectives of modular education

Modular education can be used to pursue a wide range of objectives. Summarizing an analysis of the literature in this field (Hover, 1990; Van den Berg, Reymerink & Oosting, 1990; Van Eijl et al., De Wolf & Dochy, 1989; Van Opstal, 1979), the advantages of modular education can be classified as follows:

Government policy objectives in relation to modular education:
- increasing the accessibility of higher education by means of educational programmes which permit a differentiated intake of students;
- an overall improvement in success rate and cost control, in particular by reducing the hours of face-to-face teaching.

Institute-related organizational objectives with respect to modular education:
- designing additional methods for offering education to specific target groups who need additional training;
- providing a possible basis for contract education;
- making education less teacher-dependent, resulting in lower costs and more room for new tasks;
- adjusting the educational programmes in a flexible way by simply replacing modules;
- setting up a well-defined exemptions policy;
- allowing modular certification after passing one or more examinations;
- providing a better insight into the planning of the educational process by means of a fixed duration and a normative study load;
- enabling individual students to make up deficiencies in their previous education (in the case of an intake of students with differences in their previous training).

Educational objectives:
- spreading the study load better;
- increasing the student's freedom of choice with regard to:
  - contents
  - level
  - pace
- making it possible to integrate subjects in the form of thematic or problem-based learning.

Modularization also entails a number of disadvantages. Some fundamental arguments against modularization are:
- within an entirely modularized system, social aspects do not receive sufficient attention;
- young students in particular lack the discipline necessary for a high degree of independence (Van den Berg, Reymerink & Oosting, 1990: 71);
- the transition from passively attending lectures to active studying may be problematic for some students;
- developing modules is a time-consuming activity for teachers;
- the work of teachers undergoes considerable changes to which not all teachers are necessarily favourable;

- the administration of study progress is more time-consuming in a modular system (Goldschmid & Goldschmid, 1973: 29-30).

The fact that modularization is clearly open to many different interpretations has inevitably led to misunderstandings in the past. Without exaggeration, one might say that modularization is an emotionally charged concept in a number of institutes. Rather than being an unambiguous formula, modularization is a means to achieve a variety of objectives in divergent institutes. If a particular institute opts for modularization, the objectives to be pursued must be attainable as a whole. According to Hover (1991), the chance that this principle will be betrayed is considerable. For instance, meeting the students' wishes is not the same as meeting the demands of the labour market; making education accessible to specific target groups does not by definition imply that the costs per student will decrease. In more general terms, this means that objectives relating to flexibility are very likely to conflict with objectives aiming at improving efficiency.

2.2 Types of modular education

Modules can be applied both in a traditional educational environment and in an individual learning environment as referred to by Burns (1971). On the basis of various insights deriving from learning theory, it is possible to design a number of different study systems in which modularization may play a role. In this sense, a distinction should be made between learning theory, curriculum design principles and educational methods. The discussion on educational methods and modularization evidently camouflages a debate with regard to learning theory, a few important opponents of which were already mentioned in the introduction.

The most remarkable type of modular education is presented by individual study systems in the form of self-study packages. In the Netherlands, the Open University has a leading position in the field of developing individual study packages for distance education.
Hybrid forms of education in which self-study is alternated with face-to-face teaching are also conceivable. The starting point is that a well-balanced curriculum consists of a mix of educational methods, in which face-to-face teaching, group work, the use of media and self-study have been integrated into a coherent educational whole. In this sense, the contrast between a traditional and a modular learning environment need not always be as fundamental as suggested by Dochy, Wagemans & De Wolf (1989: 13-14). Between entirely individualized self-study systems and traditional face-to-face teaching curricula, many mixed forms are possible. A number of learning environments will be discussed below. Particular attention will be paid to the role which modularization might play in this respect.

2.3 Modular education as compared to distance education

Modules for self-study offer a number of possibilities of which advantage is taken in particular by distance education. In order to make the comparison between different educational systems more transparent, we will first give a brief description of the basic characteristics of distance education. Distance education is best described as education which is not tied to a particular place or time. The teacher plays a limited role and usually has a specific function related to the written study material.

Distance education differs essentially from traditional education in the following respects: the learning experience of the students, the nature of the study material and the administrative structure of the educational institute.

Moreover, distance education is based to a large extent on learning theory principles concerning individual instruction and is aimed at students who are either unable or unwilling to attend a traditional programme for economic, geographical or social reasons (Kaye, 1989).

Regarding the study material, Holmberg (1981) distinguishes the following characteristic features of distance education:

- the curriculum has a modular structure; flexibility is provided by means of an exemptions policy;
- the study materials are designed in a systematic way with clearly formulated learning objectives; students are given the opportunity to evaluate their own performance individually or through feedback from tutors;
- a wide range of media is normally used, based on the learning needs of the students.

It may be clear that experience acquired within distance education may benefit traditional education as well. A systematically designed curriculum with a transparent exemptions policy or the possibility of obtaining module certificates are just a few elements which may increase the decisiveness and the student-orientedness of an institute to a considerable extent. Inspired by its specific mission, distance education has concentrated on the educational aspects of individual self-study. This is reflected, among other things, by the expertise acquired in the field of designing and developing study materials. Because traditional educational institutes increasingly decide to offer particular units of study as modules for self-study, this educational specialization of distance education is gaining importance. However, every educational institute is individually responsible for examining how these possibilities match its own educational mission.

3 Types of modular education at the institutional level

Institutes can be classified in different categories according to whether modularization is used to organize the programme in a traditional grade system, or whether parts of the curriculum are offered as modular units of study.

At the macro-level, these types of education can be characterized by means of the following questions: how is the programme offered, how is the time schedule organized, at what location(s) is the programme being carried out and what function - if any - does modularization have within this framework.

At the meso-level, the possibilities offered by modularization will be suggested for each of the three types. Important indicators are the degree of freedom with regard to the learning path in degree programmes, the possibility of offering individual courses and the use of new media and information technology.

At the micro-level, the student's freedom of choice is discussed. Those dimensions which determine this degree of freedom in the three systems will be compared.

In practice, a number of hybrid forms exist between the typical traditional grade system and the individualized modular system. For most educational institutes, the division of the curriculum according to a particular norm forms the first step towards modularization. Some institutes do not go beyond that point; the curriculum is divided into standardized modular units, forming a programme which is easily manageable for students, teachers and school management. In general, such standardization of the study load is the first step in the direction of an exemptions policy. This operation will make it possible to admit students with varying previous education and to offer them an adjusted study programme. Elaborating a curriculum of which a number of components have been developed into modules for self-instruction requires a number of careful considerations and choices.

Institutes can be classified according to whether modularization is used to structure the programme in a traditional grade system on the basis of a planning standard, or whether parts of the curriculum are offered as modular units of study.

More in general, these types of education can be characterized by means of the following questions: how is the programme offered, how is the time schedule organized, at what location(s) is the programme being carried out and what function - if any - does modularization have within this framework. In practice, various hybrid forms exist between the traditional grade system and the individualized modular system. On the basis of these questions it is possible to make a preliminary diagnosis of an existing educational institute and to indicate roughly in which direction the institute wishes to develop a particular modularization project. The diagram below gives an overview of these three types of modular education.

Table 1: Types of modular education at the institutional level

Form	Face-to-face teaching		Hybrid form: Face-to-face teaching and courseware package(s)			Courseware package(s)			
Location	Classroom teaching		- Classroom teaching - Courseware packages - Institute-related: e.g. - IT applications - Group work - To be selected by the student			- Modules - Institute-related: - Information techniques - Group work - To be selected by the student			
Organization over time	Traditional grade system	Semester system	Traditional grade system	Semester system	Block system	Traditional grade system	Semester system	Block system	Modular system
	Possibly no modularization		Always modularization			Always modularization			
If modularization, then	Module as a planning unit		Module as a planning unit and/or unit of study			Module as unit of study			

Face-to-face education is normally offered in classroom situations. Most institutes which organize their educational programme mainly in this way employ a traditional grade system or a semester system. This type of educational organization is most widespread and has stood the test of time. If the programme in such institutes is said to be modular, this usually means that the planning model of modularization is being used. The modularized curriculum is divided into standard units, forming a programme which is easily manageable for students, teachers and school management. As already mentioned, such standardization of the study load is the first step towards a systematic exemption policy.

As far as the organization of the programme is concerned, a hybrid form exists in which traditional face-to-face teaching is alternated with courseware packages. In this case, too, face-to-face teaching is institute-related and takes place at set times, while the courseware packages may be intended for individual self-study but may also form the basis for group assignments. In this method, information technology applications can be an essential component of the courseware packages. The programme may be offered in year grades, semesters or blocks. Usually, the entire curriculum is divided into standardized units with a particular study load, and the modules which form the basis for self-study or group work are designed as units of study with the following standard elements: entry level, objectives, content, assignments and self-test.
From an organizational point of view, the structure of such institutes is ambivalent. In the traditional educational system, the teacher integrates a wide variety of educational tasks ranging from exchanging information, giving study directions and counselling students to assessing individual study performance. The teacher's crucial role in higher education has already been discussed in detail (Van Meel, 1992); to a large extent, the functioning of the traditional educational system is only possible thanks to the generalist teachers. The transition to a modular system entails a considerable shift in the teacher's responsibilities as a result of division of labour and specialization.

Within the practical organization of modular learning environments, the intake of students, the design of educational materials, the production of educational materials, counselling and assessment of study results are clearly identifiable functions. In practice, these activities are carried out by different professionals, sometimes in multidisciplinary teams. In larger institutes, these tasks tend to be the responsibilities of different departments.

Consequently, institutes offering both traditional face-to-face teaching and modular learning environments are hybrid organizations because they employ both generalists and specialists and offer both products and services. Managing such organizations requires special care.

A third type, finally, is presented by learning materials in the form of courseware packages. These courses form the basis for individual self-study or contain the material which forms the basis for group work. Information technology applications can fulfil a function in this case too. The material can be offered in a traditional grade system in which students, for instance, may have to complete a minimum number of modules in order to be admitted to the next grade.

The semester system and the block system may be considered as variations on the same pattern. If there are no requirements with respect to the minimum amount of subject matter to be studied by students in a particular period, we are concerned with a modular system in which students effectively study per module. In this type of organization, the above-mentioned division of labour is applied rather systematically. The course material, consisting of written material and information technology applications, can be considered as the cornerstone of the study system. In addition to this material, the educational system comprises additional elements such as intake procedures, study advice, study support and examinations. From an organizational point of view, this implies that this system will rely in particular on specialists such as subject specialists, educationalists, educational technologists, specialists in the field of testing, study advisors and graphic designers. This type of institute organizes the design and production of study materials in an almost industrial way.

4 Types of modular education at the intermediate level

Assuming that the probability that the programme is modularized increases along the line from face-to-face teaching towards courseware packages, a number of remarks can be made with regard to the various types of education. They are represented in the following diagram.

Table 2: Intermediate level: types of modular education

Form	Face-to-face teaching		Hybrid form: Face-to-face teaching and courseware package(s)			Courseware package(s)			
Organization over time	Traditional grade system	Semester system	Traditional grade system	Semester system	Block system	Traditional grade system	Semester system	Block system	Course
No modularization	Possible		Possible but unlikely	Possible but unlikely	Unlikely	Unlikely			Unlikely
Modularization	Module as a planning unit		Module as a planning unit and possibly as unit of study			Module as a unit of study			Module as a unit of study
Diploma-oriented learning path	Programme determined in advance Possibly some electives		Programme determined in advance Possibly some electives			Programme determined in advance Possibly some electives			Programme determined in advance Possibly some electives, but the order of the courses is free
Seperate courses	In the case of a modular programme, in principle possible		Possible			Possible			
Use of IT / new media	Possible		Desirable for specific functions			Desirable for specific functions			

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Modularization in face-to-face teaching, usually comes down to the division of the curriculum into units of study with a standardized study load. In diploma-oriented courses, the programme is fixed to a large extent, although some courses allow the students to choose a limited number of electives. If the curriculum has been modularized, it is possible, in principle, to admit students who wish to take only a limited number of subjects. Evening classes are usually organized for these students. The following factors are commonly considered to impede the introduction of new media: the structure of the programme, the central position of the teacher and the nature of the available courseware (Eindverslag beleid nieuwe media in het Nederlandse onderwijs 1987-1991 [Final report on the new media policy in Dutch education 1987-1991], 1992: 14). A number of comments should be made in this respect. The use of new media in this type of education presupposes that sufficient material facilities are available and that the students receive special counselling. Integration of these new media into the programme breaks through the traditional grade structure because most media applications are intended for individual educational situations or for small groups. This raises a number of questions concerning the organization, the financial consequences, the curriculum, the subject matter and the educational elaboration of all these aspects. If the use of new media is not to remain limited to a single project, a systematic and coordinated approach is indispensable. At present, the policy in this respect varies from school to school and is often restricted to local experiments (Eindverslag beleid nieuwe media in het Nederlandse onderwijs 1987-1991, 1992). The institutes evidently assume a cautious attitude and try to weigh up the potential surplus value of the use of new media and the organizational costs.

Combining face-to-face teaching and courseware packages offers the possibility to organize classroom activities in addition to modular self-study and group assignments. This makes it possible to take advantage of various types of education. Besides, the number of hours of face-to-face teaching can be reduced so as to make room for new tasks. In diploma-oriented courses, the number of subjects which can be chosen is usually restricted. Because the institutes have every reason to improve the success rate, they will maintain grade systems, semester systems, block systems or other forms of student tracking systems as formal milestones in learning paths. On the basis of this approach, there are in principle numerous possibilities for offering separate courses or for providing contract education to third parties.
The use of new media is obvious in this type of organization. Interactive computer programs and videodiscs are extremely suitable for individual or group assignments. These new media may perform the following classical functions:
1 arousing interest in a particular subject
2 forming an orientation basis
3 testing and/or providing prior knowledge
4 presenting and/or explaining the subject matter
5 applying the acquired knowledge
6 evaluating
7 remedial teaching and/or reteaching (Eindverslag beleid nieuwe media in het Nederlandse onderwijs 1987-1991, 1992: 9).

In a curriculum composed of modular courseware packages, the emphasis is on self-study, which may be alternated with group work or individual assignments. "Materials designed for individual study - and in most cases these will be predominantly print materials - are prepared in a "self-instructional" manner namely: written and presented in a stimulating style, easily accessible to the student through the use of aids such as lists of learning objectives, concept maps, indices, glossaries, self-tests and reviews, attractively designed, making good use of illustrations and of different typographical styles, "student-active", containing opportunities for the student to test and monitor progress through activities, questions and self-assessment exercises embedded in the text" (Kaye, 1989: 288).

Diploma-oriented courses usually require a particular number of modules as a compulsory component while other modules may be selected by the student. Depending on the course, the order in which the modules are to be taken may also be predetermined. In these educational systems, modules are obviously always set up as units of study, allowing students to study them as separate courses. Information technology can play an important role here. In distance education systems, telecommunication networks can form an important connection between the institute and the students or between the students individually.

5 Micro-level: the student's freedom of choice

To what extent do the three educational systems allow students to determine their objectives, their study pace and their learning path themselves?
Face-to-face teaching imposes a rather inflexible pattern on the students. The programme is tied to a particular place and time, the learning path is fixed and the study contents have been established in advance. The exemptions policy can be called rigid in many cases, with the exception of those curricula which have been divided into standard units: they make it easier to grant exemptions to students on the basis of units they have already completed. There are generally certain minimum requirements with regard to previous education in such educational systems, because large differences in prior knowledge are an impediment to progress in classroom situations.

The hybrid form of face-to-face teaching combined with modules allows the students a larger degree of freedom. It is possible that particular parts of the programme are not be tied to a specific place. Diploma-oriented courses usually have a fixed programme but allow the students to choose a number of electives. The pace of study is fixed in the sense that students must complete a set minimum number of subjects within a particular period of time. This mixed system offers students the opportunity to complete their studies at a faster pace by studying a number of modules independently.

Compared to educational systems providing predominantly face-to-face teaching, systems consisting of courseware packages offer various additional degrees of freedom. In principle, they allow students to study at their own pace and at the place of their choice, as well as to select units of study and decide on their learning path individually. Various authors (Schlusmans, 1991; Van den Berg, 1991; De Wolf, 1990) consider this freedom of choice as one of the basic characteristics of the educational concept of "open learning". The students' actual freedom to effectively make these choices is determined by the policy pursued by the institute. For instance, a traditional grade system composed of modules, which requires students to follow a fixed programme and employs a student tracking system to register every student's progress by means of interim tests, limits the student's potential freedom to a considerable extent. If a connection is established between study progress and study grants, such a modular system would largely correspond to the traditional grade system, at least as far as the student's freedom of choice is concerned. A policy issue of a different order is the question of whether particular courses will be offered to specific target groups or may form the basis for contract education or corporate training courses. In this context, the student's study pace may or may not be influenced by means of study contracts, possibly in combination with student tracking systems. This is shown in the diagram below:

Table 3: Micro-level: the student's freedom of choice in the three typical educational systems

	Face-to-face teaching	Hybrid form: face-to-face teaching and courseware package(s)	Courseware package(s)
Tied to place	Always	Partly	Basically not, but depends of the nature and the objectives of the module
Tied to time	Always	Some parts	Basically not, except special assignments
Fixed learning path	Always	Usually, sometimes a combination of compulsory units in a fixed order and electives to be scheduled freely	Learning path is basically free, but may differ according to subject matter
Pace	Fixed	Fixed	Individual pace, directed by normative duration of study per module
Study contents per module	Fixed	Usually fixed	Usually fixed per module Alternative learning paths per module are possible
Exemptions policy for differentiated prior education	Possible in the case of modularization	Possible in the case of modularization	No problem
Requirements concerning minimum formal prior education	Usually	Usually	Some institutes have no formal admission requirements, but in principle they may be established

A comparison between these educational systems makes clear that face-to-face teaching imposes the highest degree of steering on the students, whereas an educational system consisting of separate courses will tend to give the students the greatest freedom. Considering the financing system for institutes for higher professional education and the present government policy, a mixture of both systems offers the best possibilities for flexible admission, exemptions, tailor-made study contracts and sufficient attention for the success rate.

6 Modular curriculum development

6.1 General starting points and innovation strategy

The basis for this section is provided by the following question: what principles can be taken as the starting point for the design of a more open learning environment? To answer this question special attention will be devoted to the possibilities offered by modularization. A number of aspects are taken into account simultaneously, such as the institute's policy concerning modularization, the power of decision of the various hierarchical levels, the organizational preconditions and the educational and didactic possibilities. Except in those cases in which modularization is limited to the development of a few modules, a number of fundamental questions must be answered in order to design a modular programme. The central issue is the combination of the objectives, the study contents and the educational method into a coherent whole. This must be accomplished in accordance with the policy pursued by the government and the institutes with respect to their mission.
Because all sections of the institute are involved in this type of educational innovation, a top-down strategy seems the most obvious approach to design a modular learning environment. An argument in favour of this top-down approach is the fact that this method is more in line with methodical organization development than a bottom-up approach; in the latter case, individual preferences may get in the way of a systematic elaboration of the programme. According to Kozma (1985), educational innovations have been shown to have a greater and more permanent impact the more firmly they are anchored in the organization. On the other hand, institutes for higher education are professional organizations, traditionally characterized by a large degree of autonomy for the teachers and relatively little coordination (Meyer & Scott, 1983; Mintzberg, 1979; Weick, 1976). Planned organization development in such an environment requires thorough consultation procedures, a considerable amount of time and sufficient involvement of all parties, including the Board, during the whole process.

Because of its inevitably far-reaching effects and complexity, this process must be kept manageable and controllable. The top-down approach is therefore subdivided into three stages. First, a policy framework is drawn up, then a concept for the modularization of the educational programme is formulated, and finally it is implemented. Thus, splitting the whole process up according to a sort of relay principle.

If a top-down approach is to have a realistic chance of success, the various decision-making levels at institutes for higher professional education should be involved in the modularization project.
The following levels of decision-making can be distinguished:
- the Board of Governors: the highest administrative body of the institute;
- the sector management: is responsible for the content of the educational process and the creation of the necessary conditions. In monosectorial institutes, the roles of the Board and the sector management largely coincide;
- the study programme director: has evolved as a third management level over the past few years;
- the staff members of the Educational Affairs and Information Technology Departments;
- the teachers.

Below, attention will be devoted to the parties which must be involved to ensure a good functioning of the decision-making process at each stage of decision-making. The idea is to set up a framework for temporary working structures within which the innovation work can be carried out.

6.2 How to start a modularization-programme: the macro-design

Determination of strategy

The aim of the macro-design is to achieve clarity and unanimity with regard to the direction to be taken by a particular institute for higher professional education in years to come. The policy objectives of the institute will be a determining factor in designing its educational programme.

For any institute, the government's policy in this area will have a major influence. In most European countries, the general trend is to seek for more effinciency and greater flexibility in order to respond to the increasing demand for permanent education and vocational training.
For example, in accordance with the Dutch government's policy concerning higher professional education (Van Meel & Jansen, 1992), it may be expected that the policy of institutes for Higher Commercial Education will largely be determined by the following set of objectives:

- a well-defined exemptions policy;
- a fixed duration and a normative study load for the various units of study;
- an improvement in success rate in terms of financing criteria;
- optimum attunement to the requirements of the labour market;
- optimum adjustment to VWO/HAVO [secondary school] students;
- fast learning paths for bright students;
- an acceptable study rate among students;
- a better spreading of the study load;
- to enhance independent study among students.

An additional reason for developing modules as units of study is that these modules can be used as the basis for courses for specific target groups (e.g. evening courses) or for contract education. Whether this will actually happen is for the Board of the institute to decide. It is important to note in this respect that overambitious objectives with regard to time and means will be a serious impediment to the implementation of the policy (Van den Berg, 1991: 32). It is therefore necessary to display due realism when establishing the objectives.

General policy framework

In line with the top-down approach, the objectives of the modularization programme are formulated on the basis of the policy objectives as laid down in the development plan. The modularization concept is the translation of the policy principles into specific aims which can be achieved by means of modularization. As has been described already, government objectives, institute-related organizational objectives and educational considerations will be weighed against one another. The next step is to make a global curriculum design. It is important in this context to consider the functions of automation, the new media, study support as well as the necessary financial resources. Questions such as whether or not student tracking systems or automated testing systems should be introduced require a policy at the institute level which can be carried out consistently in the various fields of study. Information technology generally requires major investments in hardware, software and networks. Besides, these investments entail a fixed level of operating costs every year. A policy-based approach, starting from the highest administrative level in the institute, is the obvious way to deal with these innovations in a systematic way (Emous & Gerdes, 1992: 15). The diagram below provides an overview of the policy framework outlined above:

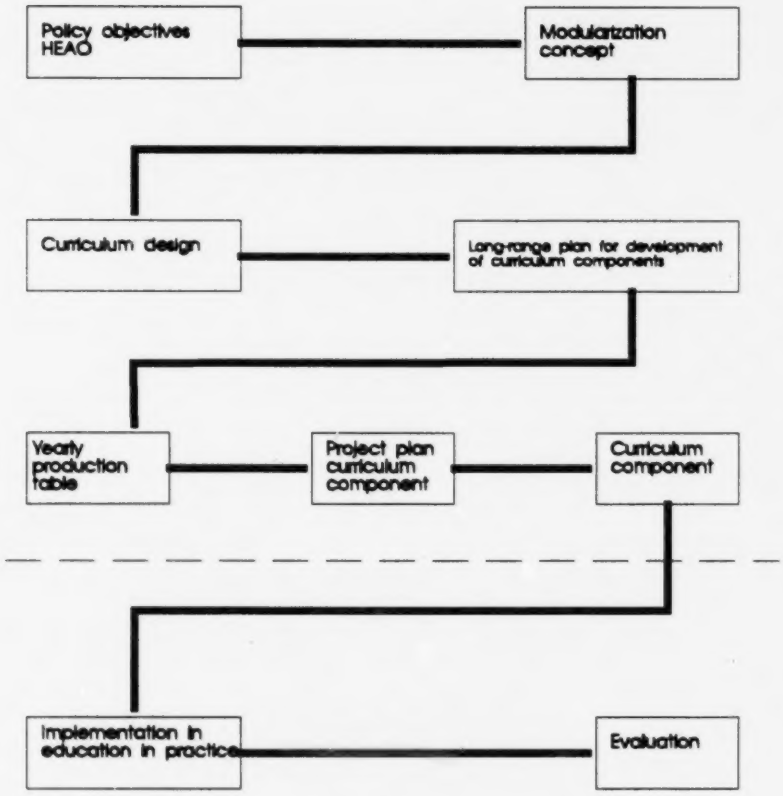

Figure 1: A policy framework for educational development in HEAO (Higher Commercial Education). Adapted from: Van der Linden, H. (1992: 10).

The long-range plan, which may be considered as an overall production plan, includes an overview of the curriculum components and indicates their various achievement stages. On the basis of this plan, a production plan is drawn up every year, and the various curriculum components are then elaborated as individual projects. Finally, each curriculum component is integrated in the programme and its workability is tested in everyday practice. Developing extensive modularization programmes may take 3 to 4 years.

The party involved: the steering committee

Establishing the institute's policy is by definition the responsibility of the Board of Governors. Van den Berg (1991: 37) proposes a number of measures to be taken by the school management to ensure that the introduction of modular education proceeds as smoothly as possible. The Board of an institute should take the lead as an "instructional leader" with great responsibility for the initiation and implementation of educational innovations. According to Van den Berg (1991), this implies for large-scale modularization projects that one of the members of the Board should supervise the process of modularization effectively, or that the management should be supported by one or more staff officers.

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However, the more the new policy deviates from what it used to be, the more essential the cooperation of the sector management and the directors of study programmes will be for the new policy to be established. The advice given by the management of the educational affairs and information technology departments is also important at this stage.

Decision documents

The result of these choices should normally be included in the institute's development plan. In addition to establishing the institute's policy, it is important that insight is provided into the progress of the modularization process from the very beginning and that the development process is organized in such a way that it remains controllable and can be adjusted if necessary.

6.3 How to organize the curriculum: the meso-design

Educational model

At the meso-level, the question is no longer whether modularization should be introduced or not, but rather which curriculum components are to be developed as modules for self-study and how this is to be done given the policy principles and possibilities that have been established. Various models are available for dividing up the curriculum, for instance according to subject, problem-based or aimed at the integration of subjects. The most efficient and simple model divides the existing curriculum into blocks, based on the subjects in the existing curriculum. For each of the various parts it is decided whether they will be offered as modules for self-study or for classroom situations. A sort of subject matter grade system is preserved in this way. In practice, this is the most frequently applied model in higher education.

The next step is to outline the curriculum components. The long-range plan includes an overview of the modularization programme and shows the various achievement stages. The development of extensive modularization programmes may take 3 to 4 years. The long-range plan can be considered as the overall production plan.

Improving the success rate and the study rate of students are important objectives. Therefore, the most obvious way to organize the curriculum would be to set up a linear structure in which units of study with increasing levels of difficulty are scheduled one after the other. Special provisions should be made to impose a minimum rate of study progress on students and - ideally - to make a faster study pace possible as well.
A uniform learning path for all students improves the identifiability of the diploma, which is considered an essential factor in providing easy access for the graduates to the labour market. Another feasible option which also meets these aims is offering a core curriculum which is identical for all students in the first year.
In more concrete terms, decisions should be taken at this stage with regard to the following programming variables at the curriculum level:
1. Structure of the year and schedule system;
2. Duration of modules;
3. Order of the modules;
4. Compulsory or optional modules;
5. Certification;
6. Number of alternative modular learning paths;
7. Resit opportunities.

The party involved: the development committee

Developing the curriculum model will take some 3 to 4 months. It is evident that this will be a period of intensive work. According to Hover (1991: 22-23), the method commonly applied by committees (each member has a certain amount of time available and meetings are held once a month) is not appropriate in this context. In addition, an internal or external project leader must be available half-time during that period, and the project group members must be relieved of their teaching duties one day per week on the same day. The short time span is sufficient because important preparatory work has already been done during step 1. This makes it superfluous to develop a large number of alternative models; it is possible to work towards well-defined aims from the beginning.
It is of major importance that a special organizational provision be created which allows bypassing of existing procedures and methods if necessary (Hover, 1991: 22-23).
On the basis of experience acquired in the development of modular education at the Open University in the Netherlands and elsewhere, it has turned out that these activities are best carried out in a small working group consisting of 7 persons at the most. At this stage, the aim is to formulate a proposal as the basis for a programme which does justice to the demands of the labour market, the developments in the various fields of study, the policy objectives of the government and the institute, and the educational possibilities in this respect. It may be clear that finding an optimum solution to satisfy these divergent demands is no sinecure.
In order to formulate a good proposal which takes into account the management's responsibility and the abilities and wishes of the staff, the following rules of thumb may provide a point of departure for the composition of the project group:

- the members must be open-minded with regard to educational development; it should be avoided that members with radical views dominate the group;
- there should be a balance between the representatives of the various sectors/departments;
- the members must have acquired sufficient experience within the institute and must be respected by their colleagues and by the management.

Decision documents

At the end of the process, clarity and unanimity must have been achieved with regard to the curriculum, the partitioning of the curriculum and the curriculum components which will be elaborated as units of study. It is possible that a number of components of the curriculum remain the way they used to be, whereas others will undergo fundamental changes. An overview of the components to be developed should be included in a long-range plan, indicating the various stages in which the activities will be carried out.

6.4 How to devise the modules for self-study: the micro-design

Consequently to a project management approach, an overall module description to which all parties agree should be drawn up in the first stage. Each part of this overall project plan is then elaborated in greater detail.

Educational model

The transition from only face-to-face teaching to a mixture of face-to-face teaching and modules for self-study requires that the curriculum components be designed in such a way that they together form a programme which is specially adapted to the objectives of the institute and the final requirements of the diploma. The micro-design of an institute for Higher Professional Education must by definition be "made to measure" and will vary from institute to institute. As has been described already, modules for self-study offer very diverse potential advantages.

The main ones are: improving the students' capacity for teacher-independent study, extension to various new target groups, possibilities for the integration of new media, acquiring specific skills concerning independent studying, permitting a differentiated intake of students, a better spreading of the study load, etc. Before a start can be made with the elaboration of the modules, a number of decisions on these objectives must have been taken at the macro-level and meso-level. Starting from the yearly production table, a micro-level analysis is generally made of the educational approach which would be most suitable. Next, the combination of written material, electronic media and study support which would be most appropriate for each curriculum component is decided. Using adapted project management techniques, the development work is organized in such a way that it can be carried out in a purposeful and controllable way.

The following starting points apply to modules which are developed as units for self-study:

1. The module contains a specific portion of the subject matter which is coherent in relation to the course requirements and the learning objectives. A module deals with a particular theme, subject or set of subjects.

2. As an educational unit, the module contains both the presentation of the subject matter via lectures, books and readers and the processing of the subject matter via self-study, group work, computer-assisted learning, practicals etc., as well as the assessment of the learning results. Both the hours of face-to-face teaching and the other hours spent on studying the module are considered to be part of the module.

In contrast to what was suggested by Van Eijl et al. (1988: 39), it is not necessary that a module can be scheduled anywhere within the educational system, because this principle has a number of complicating consequences for diploma-oriented courses, for instance with respect to the entry requirements per unit of study.

In more concrete terms, the following variables can be distinguished at the module level:

1. Modular model;
2. Educational model;
3. Media mix per module;
4. Study support;
5. Examination;
6. Study guide.

Depending on their place and function in the curriculum, the following types of module may be found: introductory modules, basic modules, optional modules, integration modules, preparatory modules, subject-specific modules, practical modules and thematic modules. The educational model is established on the basis of a number of considerations. The decisive factors here are the learning objectives, the student's learning experience, the desired amount of freedom with regard to time and place of the learning process, individual or group activities, development costs, operating costs, and the possibilities for using a module outside the regular educational programme. Experience acquired by the Dutch Open University in developing modules for distance education has made it possible to describe a number of educational models at the modular level.

Some of these considerations have been listed in the diagram below:

Table 4: Educational models at the modular level
Adapted from: Van den Boom, G., H. van den Brink, H. Hummel, P. Kirschner & K. Schlusmans (1989: 76)

Educational and institutional parameters / Modular model	Learning objectives	Learning experience required	Development costs	Operating costs	Possibilities for use outside the institute
Study unit model	Knowledge and insight	Little	Very high	Low	Good
Textbook-workbook	Knowledge and insight	Little	High	Low	Reasonable
Textbook-sources material	Process of acquiring knowledge	Little	High	Low	Good
Textbook-question book	Knowledge and insight	Quite much	Quite low	Average	Reasonable
Study task model	Application Problemsolving	Much	Quite high	Average	Reasonable
Case study model	Problemsolving Attitudes	Quite much	High	Average	Good
Dissertation model	Application Acquiring knowledge independently	Much	Low	High	Not applicable
Apprenticeship model	Acquiring practical experience	Much	Low	Quite high	Not applicable

The media mix per module is concerned with the choice between and the combination of various media ranging from written material, audio and audiovisual material, computer-assisted instruction and network support to the specific roles and tasks of teachers and tutors. Factors to be taken into account are the institute's policy in this field, the learning objectives, the specific functions of these media and the production costs.

With regard to study support, a distinction should be made between the subject-specific activities normally belonging to the tasks of the teachers in institutes for Higher Commercial Education on the one hand, and the counselling/supporting activities which may be defined as study support on the other. A number of organizational provisions must be made to make the counselling and supporting activities possible. A minimum provision would be to furnish specially adjusted information to students before and during their studies, although additional informative sessions on study skills and self-study may have a positive effect on their study rate. In general it is true that the more emphasis is placed on self-study, the more important an effective form of study support is. In this case, too, the institute's policy is a determining factor.

The tests should be in accordance with the learning objectives, the subject matter and the study activities contained in the module (Van Eijl et al., 1988: 119). It is preferable to develop several series of examinations for each module within the framework of the development process.

Depending on whether the institute has an automated testing system or not, a number of rules will apply to the development of these items.

To ensure that modules are used in an appropriate manner, a study guide containing general information on the modules is indispensable. Important informative elements in such a guide are:

1 title, code, author, institute and year;
2 the number of credit points to be obtained through the module concerned and/or the study load envisaged for the module;
3 a preface (if desired);
4 an introduction presenting the motives behind the contents of the module;
5 a description of the aim and the final attainment level;
6 course requirements, including the required materials, equipment, classrooms, possibilities for exemption and references;
7 a timetable of sessions and tests, the tutor and/or group members (or classmates);
8 the setup of the module;
9 study tasks, study directions and opportunities for self-assessment;
10 the subject matter, or references to the subject matter;
11 the testing procedure, including possibilities for resits and compensation;
12 self-assessment test (including answers and standards for assessment);
13 an overview of connections with other parts of the programme;
14 evaluation form.

The party involved: the project team

The implementation of the yearly production plan consists of the development of individual project plans for each curriculum component and the development of the learning materials. This is mainly the task of teachers and project leaders, possibly in cooperation with staff members of the educational affairs and information technology departments. In most institutes, the regular programme will have to be continued while the modules are being developed. Due care should therefore be taken in planning the development work and relieving teachers from their teaching duties.
During the design and development of the modules, working on the basis of projects is the best way to achieve results in the most effective manner (Hover, 1991: 22-23). Important preconditions for this approach are good and well-defined relations between the project team on the one hand and the department coordinator and the study programme director on the other. The project-based approach requires that a rough description of the module to which all parties agree is drawn up in the first stage. Each part of this overall project plan is then elaborated separately in greater detail.

Decision documents

The decision documents required for developing a module on the basis of projects will be discussed below.
The project-based approach requires that a rough description of the module to which all parties agree is drawn up in the first stage. Each part of this overall project plan is then elaborated separately in greater detail.

Below, a systematic method for the efficient development of modules will be described. The average duration of a module development process may vary from a few weeks to a few months.

It is useful, therefore, to design a general system which can be applied in the development of various modules. This procedure has three advantages: first, the work is carried out effectively; second, it produces an experience curve; and third, the members of the project team become acquainted with heuristics which can also be applied in other projects. The basis for the approach is formed by general principles developed within the framework of project management and experience acquired during course development at the Open University.

7 Conclusions

The transition from classical educational systems towards more open and flexible educational programmes is taking place step by step. It has already become clear that modularization can make an important contribution to this process. Modularization allows to achieve a wide range of objectives in higher education. This is shown for instance by the different views held in this respect by the government, the institutes and the educational technologists.

Considering the government's current policy, it is justified to contend that flexibility, quality and improvement of the success rate will remain on the agenda of both the government and the institutes for higher education. Modularization can in principle be introduced in widely divergent educational systems which, from the point of view of learning theory, are based on different principles. So far, most experience with regard to designing and using modular study material aimed at self-study has been acquired in distance education.

In higher education, modularization is generally regarded as a means to organize the programme more efficiently. At the same time an effort is done to maintain and to improve its educational quality and bringing it more in line with the demand for additional training.

In order to set up educational innovations in a structural way in practice, they must be anchored in the organizational context on a permanent basis. In more concrete terms, this means that there is an urge for instruments to carry out the lasting accomplishments of these educational innovations at the various hierarchical levels of an educational institute. In other words, educational innovation goes hand in hand with organization development.

Numerous research programmes have shown that organization development within the context of higher education is a knotty problem. Nevertheless, a number of guidelines can be deduced from the various investigations. One can put forward, for instance, that educational innovation requires the permanent involvement of the management during the entire process, that a top-down strategy is the most appropriate approach and that a prudent personnel policy is indispensable. In accordance with these findings, a systematic policy model has been developed in this report involving all sections of the educational institute.

A modularization programme consists of three stages:
During the first stage, modularization is primarily a matter of policy in which the objectives are of paramount importance. The decision to divide the study load into standardized units is usually taken in this stage. In terms of student-orientedness, this makes the programme easier to deal with and allows a better spreading of the study load. With regard to the aim of making the programme accessible to a wider public, this first stage provides the means to elaborate an adjusted exemptions policy.

The second stage of modularization is aimed at the curriculum. On the basis of the demands of the labour market, the final requirements of the diploma and the objectives of the modularization programme, it is decided for each module whether it will be offered for classroom use or for individual self-study. This curriculum design method offers a number of advantages. The modular structure permits rapid adjustment to new developments; in this sense, the institute's ability to respond is increased. With regard to the integration of new media, which often break through the traditional grade structure, modules for self-study offer an extra incentive, provided that they can be fitted into the financial framework. The system also offers a number of plus points for students: it requires a well-considered setup and in principle offers the opportunity for a more diversified educational mix and working methods. Students who wish to complete the course at a faster pace may have the opportunity to do so. Besides, this system makes it possible to offer an adjusted study programme to students who differ as regards their previous education.

The third stage is the logical elaboration of a number of decisions taken during stages 1 and 2. According to the plan, a number of modules is elaborated step by step every year, requiring a number of decisions at the modular level. This can be done efficiently, because the frameworks for policy and didactics are now clear. At this level, it is possible to offer a higher degree of flexibility and openness, for instance by including additional study directions and specific assignments in the modules in order to meet the wishes of particular categories of students.

The first stage of modularization need not necessarily lead to the following stages. A number of institutes may restrict themselves to this stage. In the next two stages, it is also conceivable that not all projects are equally ambitious. Because the objectives and possibilities vary from institute to institute, the design and elaboration of a modularization programme are by definition "made to measure". The best approach is therefore a pragmatic one, which strikes a balance between what is desirable and what is possible.

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